RIGOL

Programming Guide

DG10X2 Function/Arbitrary Waveform Generator

DG1012: 15MHz
DG1022: 20MHz

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Structure of this Document

Chapter 1 Programming Overview

This chapter introduces you how to programme DG10X2 generator using commands and how to input the commands in right format.

Chapter 2 DG10X2 Commands System

This chapter gives detailed information on each command supported by DG10X2, including command format, function description, considerations when using command as well as some application examples.

Chapter 3 Application Examples

This chapter shows you how to realize the examples in《DG10X2 User's Guide》via command lines.

Appendix: Commands Reference A-Z

The Appendix lists all the commands alphabetically in favor of quick reference.

Hint:

For the newest edition of this manual please go to http://www.rigolna.com/download_manual.aspx to download.

Table of Contents

Chapter 1 Programming Overview 1-1
Communication Interfaces 1-2
Commands Introduction 1-3
Commands Format 1-3
Symbol Instruction 1-4
Parameter Types 1-5
Commands Abbreviation 1-6

Chapter 2 DG10X2 Commands System 2-1
IEEE 488.2 2-2
APPLy 2-3
FUNCtion 2-9
FREQuency 2-14
VOLTage 2-17
OUTPut 2-22
PULSe 2-27
AM 2-30
FM 2-33
PM 2-36
FSKey 2-39
SWEep 2-42
TRIGger 2-44
BURSt 2-46
DATA 2-49
MEMory 2-53
SYSTem 2-55
PHASe 2-58
DISPlay 2-60
COUPling 2-61

Chapter 3 Application Examples 3-1
Example 1: To generate a sine wave via CH1 3-2
Example 2: To generate a built-in arbitrary wave via CH1 3-3
Example 3: To generate a user-defined avbitrary wave via CH1 3-4
Example 4: To generate a FSK wave via CH1 3-6
Example 5: To generate a linear sweep wave via CH1 3-7

Example 6: To generate a burst via CH1 3-8
Example 7: To output waves via dual channels 3-9
Example 8: Channel Coupling 3-10
Example 9: Channel Copy 3-11

Appendix: Commands Reference A-Z 1

Chapter 1 Programming Overview

This chapter introduces you how to programme DG10X2 generator using commands and how to input commands in right format.

This chapter contains the following sections:

- Communication Interfaces
- Commands Introduction
  Commands Format
  Symbol Instruction
  Parameter Types
  Commands Abbreviation

Communication Interfaces

Computers communicate with the generator by sending and receiving messages over an USB interface. Command word is sended and identified in the form of ASCII character strings for users to easily control and do user-defined development.

Operations that you can do with a computer and a generator include:

- Set the generator.
- Output waveforms from the generator.

Connection:
Please connect the USB Device port of DG10X2 with the corresponding USB interface on the computer using an USB cable.

Commands Introduction

Commands Format

The commands system of DG10X2 is a tree structure, and each of sub-system is consists of a "root" keyword and multilayered keywords. The keywords are separated by ":" and aoptional parameters are permitted to follow; "?" appeared following a command line denotes to query this function; besides, "space" is used to divide command and parameter.

For example:
FUNCtion:SQUare:DCYCle {<percent>|MINimum|MAXimum}
FUNCtion:SQUare:DCYCle? [MINimum|MAXimum]

FUNCtion is the root keyword of a commmand line, **SQUare** and **DCYCle** is the second and third keyword, all of them are separated by ":". <percent> denotes the parameters permitted to be set by user; "?" denotes to query; the command **FUNCtion:SQUare:DCYCle** and parameter are separated by "space".

"," is usually used to compart multiple parameters existed in one command, for example:
DATA VOLATILE,<value>,<value>, . . .

Symbol Instruction

Following symbols are not included in commands, but whichi are usually used to assist to explain the parameters containd in a command line.

1. Braces { }

The parameters or contents enclosed in a **{ }** are reqired. Only one content or parameter could be selected every time, and all the options are separated by **"|"**. For example: {ON|OFF} indicateds that **ON** or **OFF** can be selected.

2. Square brackets [ ]

Some keywords or contents are enclosed by square bracket **[ ]**, which indicates that those parameters are optional and will be execute no matter whether been ignored or not.

For example:

DATA:COPY <destination arb name>[,VOLATILE]

This command copys the wave from volatile memory to the specified nonvolatile memory. Note: [,VOLATILE] may be ignored.

3. Triangle Brackets < >

An item enclosed in **< >** should be replaced by an effective value.

For example:

DISPlay:CONTRAST <value>

Note: <value> must be a numerical value, such as:

DISPlay:CONTRAST 25

Parameter Types

The commands contain 5 kinds of parameters, different parameters have different setting methods.

1. Boolean Parameters

The parameters could be "OFF", "ON" or "0", "1", for example:
AM:STATE {OFF|ON}
"OFF" denotes disable AM function. "On" denotes enable.

2. Consecutive Integer Parameters

The parameters could be a consecutive integer, for example:
DISPlay:CONTRAST <value>
<value> could be an integer between 0 and 31(including 0 and 31).

3. Consecutive Real Number Parameters

The parameters could be any value only in effective range and precision permiting, for example:
FREQuency {<frequency>|MINimum|MAXimum}
As a sine wave, <frequency> should be any real number between 0Hz~20MHz.

4. Discrete Parameters

The parameters could be a cited value, for example,
MEMory:STATe:NAME? {0|1|2|3|4|5|6|7|8|9|10}
The parameter could only be 0, 1, 2, 3, 4, 5, 6. 7, 8, 9, 10.

5. ASCII Character String

The parameters should be composed of ASCII character string, for example,
DATA:COPY <destination arb name>[,VOLATILE]
<destination arb name> is a character string defined by user.

Commands Abbreviation

All the comands are case-insensitive, so you can use any kind of them. But if use abbreviation, the capital letters specified in commands must be written completely. For example:
FUNCtion:SQUare:DCYCle? also can be:
FUNC:SQU:DCYC? or func:squ:dcyc?

Chapter 2 DG10X2 Commands System

This chapter gives detailed information on each command supported by DG10X2, including command format, function description, using considerations as well as some application examples.

DG10X2 contains following subcommands systems:

- IEEE 488.2
- APPLy
- FUNCtion
- FREQuency
- VOLTage
- OUTPut
- PULSe
- AM
- FM
- PM
- FSKey
- SWEep
- TRIGger
- BURSt
- DATA
- MEMory
- SYSTem
- PHASe
- DISPlay
- COUPling

IEEE 488.2

IEEE standard has some common commands for querying some basic information about instrument or executing, which usually begins with "*" and holds 3-character long command keyword.

DG10X2 supports following IEEE488.2 commands:

1. *IDN?

1. *IDN?	
Command Format	*IDN?
Function	Query ID character string of instrument, including a field separated by 4 ",", manufactory, model, serial number and the edition number that consists of numbers and separated by "." .
Return Format	RIGOL TECHNOLOGIES,DG1022,DG1000000002, 00.01.00.04.00

APPLy

APPLy commands provide the most straightforward method to program the generator over remote interface. Among following commands, the instrument could set and output waveforms if OUTPUT function is enable.

DG10X2 supports following **APPLy** commands:

1. APPLy:SINusoid
2. APPLy:SQUare
3. APPLy:RAMP
4. APPLy:PULSe
5. APPLy:NOISe
6. APPLy:DC
7. APPLy:USER
8. APPLy?
9. APPLy:SINusoid:CH2
10. APPLy:SQUare:CH2
11. APPLy:RAMP:CH2
12. APPLy:PULSe:CH2
13. APPLy:NOISe:CH2
14. APPLy:DC:CH2
15. APPLy:USER:CH2
16. APPLy:CH2?

The detailed information of each command are:

1. APPLy:SINusoid	
Command Format	APPLy:SINusoid [<frequency>[,<amplitude>[,<offset>]]]
Function	Generate a sine wave with specific frequency, amplitude and DC offset via CH1.
Explanations	● If the parameters you set are less than three, the sequence would be: <frequency>, <amplitude>, <offset>. ● The default units of <frequency>, <amplitude>, <offset> are: Hz, Vpp, V_{DC}.
Example	APPL:SIN 1000,5.0,-1.5

2. APPLy:SQUare	
Command Format	APPLy:SQUare [<frequency>[,<amplitude>[,<offset>]]]
Function	Generate a square wave with specific frequency, amplitude and DC offset via CH1 and cover the current duty cycle settings and select 50% automaticly.
Explanations	● If the parameters you set are less than three, the sequence would be: <frequency>, <amplitude>, <offset>. ● The default units of <frequency>, <amplitude>, <offset> are: Hz, Vpp, V_{DC}.
Example	APPL:SQU 1000,5.0,-1.5
3. APPLy:RAMP	
Command Format	APPLy:RAMP [<frequency>[,<amplitude>[,<offset>]]]
Function	Generate a ramp wave with specific frequency, amplitude and DC offset via CH1 and cover the current symmetry settings and select 50% automaticly.
Explanations	● If the parameters you set are less than three, the sequence would be: <frequency>, <amplitude>, <offset>. ● The default units of <frequency>, <amplitude>, <offset> are: Hz, Vpp, V_{DC}.
Example	APPL:RAMP 1000,5.0,-1.5
4. APPLy:PULSe	
Command Format	APPLy:PULSe [<frequency>[,<amplitude>[,<offset>]]]
Function	Generate a pulse wave with specific frequency, amplitude and DC offset via CH1.
Explanations	● If the parameters you set are less than three, the sequence would be: <frequency>, <amplitude>, <offset>. ● The default units of <frequency>, <amplitude>, <offset> are: Hz, Vpp, V_{DC}.
Example	APPL:PULS 1000,5.0,-1.5
5. APPLy:NOISe	
Command	APPLy:NOISe [<frequency |DEFault>[,<amplitude>[,<offset>]]]

Format	
Function	Generate Gaussian noise with specific amplitude and DC offset.
Explanations	● Although the frequency parameter made no impression on this command, a value or "DEFault" must be specified. (noise function has 5MHz of bandwidth) ● If the parameters you set are less than three, the sequence would be: <frequency>, <amplitude>, <offset>. ● The default units of <frequency>, <amplitude>, <offset> are: Hz, Vpp, V_{DC}.
Example	APPL:NOIS DEF,5.0,2.0
6. APPLy:DC	
Command Format	APPLy:DC [<frequency|DEFault>[,<amplitude>|DEFault>[,< offset>]]]
Function	Generate a DC with electrical level specified by < offset > parameter via CH1.
Explanations	● Although the frequency and amplitude parameter made no impression on this command, a value or "DEFault" must be specified. ● If the parameters you set are less than three, the sequence would be: <frequency>, <amplitude>, <offset>. ● The default units of <frequency>, <amplitude>, <offset> are: Hz, Vpp, V_{DC}.
Example	APPL:DC DEF,DEF,-2.5
7. APPLy:USER	
Command Format	APPLy:USER [<frequency>[,<amplitude>[,<offset>]]]
Function	Generate an arbitrary wave selected by **FUNCtion:USER** command with specific frequency, amplitude and DC offset.
Explanations	● If the parameters you set are less than three, the sequence would be: <frequency>, <amplitude>, <offset>. ● The default units of <frequency>, <amplitude>, <offset> are: Hz, Vpp, V_{DC}.
Example	APPL:USER 1000,5.0,-1.5
8. APPLy?	

Command Format	APPLy?
Function	Query the current configuration of CH1 and the type of waves outputted.
Explanations	The query returns a character string with double quotation marks, including function, frequency, amplitude and offset.
Example	CH1:"SIN,1.000000e+03,5.000000e+00,-1.500000e+00"
9. APPLy:SINusoid:CH2	
Command Format	APPLy:SINusoid:CH2 [<frequency>[,<amplitude>[,<offset>]]]
Function	Generate a sine wave with specific frequency, amplitude and DC offset via CH2.
Explanations	● If the parameters you set are less than three, the sequence would be: <frequency>, <amplitude>, <offset>. ● The default units of <frequency>, <amplitude>, <offset> are: Hz, Vpp, V_{DC}.
Example	APPL:SIN:CH2 1000,5.0,-1
10. APPLy:SQUare:CH2	
Command Format	APPLy:SQUare:CH2 [<frequency>[,<amplitude>[,<offset>]]]
Function	Generate a square wave with specific frequency, amplitude and DC offset via CH2 and cover the current duty cycle settings and select 50% automaticly.
Explanations	● If the parameters you set are less than three, the sequence would be: <frequency>, <amplitude>, <offset>. ● The default units of <frequency>, <amplitude>, <offset> are: Hz, Vpp, V_{DC}.
Example	APPL:SQU:CH2 1000,5.0,-1
11. APPLy:RAMP:CH2	
Command Format	APPLy:RAMP:CH2 [<frequency>[,<amplitude>[,<offset>]]]
Function	Generate a ramp wave with specific frequency, amplitude and DC offset via CH2 and cover the current symmetry settings and select 50% automaticly.

Explanations	● If the parameters you set are less than three, the sequence would be: <frequency>, <amplitude>, <offset>. ● The default units of <frequency>, <amplitude>, <offset> are: Hz, Vpp, V_{DC}.
Example	APPL:RAMP:CH2 1000,5.0,0.5
12. APPLy:PULSe:CH2	
Command Format	APPLy:PULSe:CH2 [<frequency>[,<amplitude>[,<offset>]]]
Function	Generate a pulse wave with specific frequency, amplitude and DC offset via CH2.
Explanations	● If the parameters you set are less than three, the sequence would be: <frequency>, <amplitude>, <offset>. ● The default units of <frequency>, <amplitude>, <offset> are: Hz, Vpp, V_{DC}.
Example	APPL:PULS:CH2 1000,5.0,0.5
13. APPLy:NOISe:CH2	
Command Format	APPLy:NOISe:CH2[<frequency|DEFault>[,<amplitude>[,<offset>]]]
Function	Generate Gaussian noise with specific amplitude and DC offset via CH2.
Explanations	● Although the frequency parameter made no impression on this command, a value or "DEFault" must be specified. (noise function has 5MHz of bandwidth) ● If the parameters you set are less than three, the sequence would be: <frequency>, <amplitude>, <offset>. ● The default units of <frequency>, <amplitude>, <offset> are: Hz, Vpp, V_{DC}.
Example	APPL:NOIS:CH2 DEF, 5.0, 0.5
14. APPLy:DC:CH2	
Command Format	APPLy:DC:CH2[<frequency|DEFault>[,<amplitude>|DEFault>[,<offset>]]]
Function	Generate a DC with electrical level specified by <offset> parameter via CH2.
Explanations	● Although the frequency and amplitude parameter made no

	impression on this command, a value or "DEFault" must be specified. ● If the parameters you set are less than three, the sequence would be: <frequency>, <amplitude>, <offset>. ● The default units of <frequency>, <amplitude>, <offset> are: Hz, Vpp, V_{DC}.
Example	APPL:DC:CH2 DEF,DEF,1.5
15. APPLy:USER:CH2	
Command Format	APPLy:USER:CH2 [<frequency>[,<amplitude>[,<offset>]]]
Function	Generate an arbitrary wave selected by **FUNCtion:USER:CH2** command with specific frequency, amplitude and DC offset.
Explanations	● If the parameters you set are less than three, the sequence would be: <frequency>, <amplitude>, <offset>. ● The default units of <frequency>, <amplitude>, <offset> are: Hz, Vpp, V_{DC}.
Example	APPL:USER:CH2 1000,5.0,-1.5
16. APPLy:CH2?	
Command Format	APPLy:CH2?
Function	Query the current configuration of CH2 and the type of waves outputted.
Explanations	The query returns a character string with double quotation marks, including function, frequency, amplitude and offset.
Example	CH2:"SIN,1.000000e+03,5.000000e+00,-1.500000e+00"

FUNCtion

FUNCtion commands are used for setting the output function and their parameters; selecting carrier wave function in modulation mode; choosing any one from 48 built-in arbitrary waveforms and 10 user-defined waveforms, or the waveform downloaded to volatile memory currently.

DG10X2 supports following **FUNCtion** commands:

1. FUNCtion
2. FUNCtion?
3. FUNCtion:USER
4. FUNCtion:USER?
5. FUNCtion:SQUare:DCYCle
6. FUNCtion:SQUare:DCYCle?
7. FUNCtion:RAMP:SYMMetry
8. FUNCtion:RAMP:SYMMetry?
9. FUNCtion:CH2
10. FUNCtion:CH2?
11. FUNCtion:USER:CH2
12. FUNCtion:USER:CH2?
13. FUNCtion:SQUare:DCYCle:CH2
14. FUNCtion:SQUare:DCYCle:CH2?
15. FUNCtion:RAMP:SYMMetry:CH2
16. FUNCtion:RAMP:SYMMetry:CH2?

The detailed information of each command are:

1. FUNCtion	
Command Format	FUNCtion {SINusoid|SQUare|RAMP|PULSe|NOISe|DC|USER}
Function	Select the output function for CH1.
Explanations	If send **FUNC DC** and then **FUNC USER**, the output is still DC.
Example	FUNC SIN
2. FUNCtion?	
Command Format	FUNCtion?

Function	Query the output function from CH1.
Explanations	The query always returns CH1:ARB after sending FUNC DC or FUNC USER.
Example	The query returns CH1:SIN, CH1:SQU, CH1:RAMP, CH1:PULS, CH1:NOIS or CH1:ARB, the default is CH1:SIN.
3. FUNCtion:USER	
Command Format	FUNCtion:USER {<name of arbitrary wave>|VOLATILE}
Function	Separately select any one wave from built-in arbitrary waves and 10 user-defined waves for CH1 or select the wave that has been downloaded into volatile memory.
Explanations	● The built-in waves contains: Common: NegRamp/AttALT/AmpALT/StairDown/StairUp/StairUD/Cpulse/ PPulse/NPulse/Trapezia/RoundHalf/AbsSine/AbsSineHalf/ SINE_TRA/SINE_VER Math: Exp_Rise/Exp_Fall/Tan/Cot/Sqrt/X^2/Sinc/Gauss/HaverSine/ Lorentz/Dirichlet/GaussPulse/Airy Project: Cardiac/Quake/Gamma/Voice/TV/Combin/BandLimited/ Stepresponse/Butterworth/Chebyshev1/ Chebyshev2 Window Function: Boxcar/Barlett/triang/Blackman/Hamming/Hanning/Kaiser Others: Roundpm/DC ● Send FUNC DC command when use DC. ● Abbreviation is invalid.
Example	FUNC:USER VOLATILE
4. FUNCtion:USER?	
Command Format	FUNCtion:USER?
Function	Query the name of arbitrary wave generated from CH1.
Return Value	The query returns the name of built-in arbitrary wave that has been selected. (such as EXP_RISE), VOLATILE or returns any name of

	user-defined wave in nonvolatile memory. The default is EXP_RISE.
5. FUNCtion:SQUare:DCYCle	
Command Format	FUNCtion:SQUare:DCYCle {<percent>|MINimum|MAXimum}
Function	Set the duty cycle of square wave for CH1.
Explanations	<percent> is the percent of duty cycle selected, MIN is the minimum duty cycle and MAX is the maximum.
Example	FUNC:SQU:DCYC 50
6. FUNCtion:SQUare:DCYCle?	
Command Format	FUNCtion:SQUare:DCYCle? [MINimum|MAXimum]
Function	Query the duty cycle of square wave from CH1.
Return Value	The query returns current duty cycle settings with the format of percent, such as 50.000000.
7. FUNCtion:RAMP:SYMMetry	
Command Format	FUNCtion:RAMP:SYMMetry {<percent>|MINimum|MAXimum}
Function	Set the symmetry of ramp wave for CH1.
Explanations	<percent> is the selected percent of duty cycle; MIN＝0％, MAX＝100％.
Example	FUNC:RAMP:SYMM 50
8. FUNCtion:RAMP:SYMMetry?	
Command Format	FUNCtion:RAMP:SYMMetry? [MINimum|MAXimum]
Function	Query the symmetry of ramp wave from CH1.
Return Value	The query returns current symmetry settings with the format of percent, such as 50.000000.
9. FUNCtion:CH2	
Command Format	FUNCtion:CH2 {SINusoid|SQUare|RAMP|PULSe|NOISe|DC|USER}
Function	Select the output function form CH2.
Explanations	If send **FUNC:CH2 DC** and then **FUNC:CH2 USER**, the output is

	still DC.
Example	FUNC:CH2 SIN
10. FUNCtion:CH2?	
Command Format	FUNCtion:CH2?
Function	Query the output function from CH2.
Explanations	The query always returns CH2:ARB after sending FUNC:CH2 DC or FUNC:CH2 USER.
Example	The query returns CH2:SIN, CH2:SQU, CH2:RAMP, CH2:PULS, CH2:NOIS or CH2:ARB, the default is CH2:SIN.
11. FUNCtion:USER:CH2	
Command Format	FUNCtion:USER:CH2 {< name of arbitrary wave >|VOLATILE}
Function	Separately select any one wave from built-in arbitrary waves and 10 user-defined waves for CH2 or select the wave that has been loaded into volatile memory.
Explanations	● The built-in waves contains: Common: NegRamp/AttALT/AmpALT/StairDown/StairUp/StairUD/Cpulse/ PPulse/NPulse/Trapezia/RoundHalf/AbsSine/AbsSineHalf/ SINE_TRA/SINE_VER Math: Exp_Rise/Exp_Fall/Tan/Cot/Sqrt/X^2/Sinc/Gauss/HaverSine/ Lorentz/Dirichlet/GaussPulse/Airy Project: Cardiac/Quake/Gamma/Voice/TV/Combin/BandLimited/ Stepresponse/Butterworth/Chebyshev1/ Chebyshev2 Window Function: Boxcar/Barlett/triang/Blackman/Hamming/Hanning/Kaiser Others: Roundpm/DC ● Send FUNC:CH2 DC command when use DC. ● Abbreviation is invalid.
Example	FUNC:USER:CH2 SINC

12. FUNCtion:USER:CH2?	
Command Format	FUNCtion:USER:CH2?
Function	Query the name of arbitrary wave generated from CH2.
Return Value	The query returns the name of built-in arbitrary wave that has been selected. (such as EXP_RISE), VOLATILE or returns any name of user-defined wave in nonvolatile memory. The default is EXP_RISE.
13. FUNCtion:SQUare:DCYCle:CH2	
Command Format	FUNCtion:SQUare:DCYCle:CH2 {<percent>|MINimum|MAXimum}
Function	Set the duty cycle of square wave for CH2.
Explanations	<percent> is the selected percent of duty cycle, MIN is the minimum duty cycle and MAX is the maximum.
Example	FUNC:SQU:DCYC:CH2 50
14. FUNCtion:SQUare:DCYCle:CH2?	
Command Format	FUNCtion:SQUare:DCYCle:CH2? [MINimum | MAXimum]
Function	Query the duty cycle of square wave from CH2.
Return Value	The query returns current duty cycle settings with the format of percent, such as 50.000000.
15. FUNCtion:RAMP:SYMMetry:CH2	
Command Format	FUNCtion:RAMP:SYMMetry:CH2 {<percent>|MINimum|MAXimum}
Function	Set the symmetry of ramp wave for CH2.
Explanations	<percent> is the selected percent of duty cycle; MIN＝0％, MAX＝100％.
Example	FUNC:RAMP:SYMM:CH2 50
16. FUNCtion:RAMP:SYMMetry:CH2?	
Command Format	FUNCtion:RAMP:SYMMetry:CH2? [MINimum|MAXimum]
Function	Query the symmetry of ramp wave from CH2.
Return Value	The query returns current symmetry settings with the format of percent, such as 50.000000.

FREQuency

FREQuency commands are used for setting: the frequency of output function from dual channels; the start frequency, the center frequency or the span frequency in sweep mode, the carrier frequency in modulation. Sweep and modulation are only valid for CH1.

DG10X2 supports following **FREQuency** commands:

1. FREQuency
2. FREQuency?
3. FREQuency:CH2
4. FREQuency:CH2?
5. FREQuency:STARt
6. FREQuency:STARt?
7. FREQuency:STOP
8. FREQuency:STOP?
9. FREQuency:CENTer
10. FREQuency:CENTer?
11. FREQuency:SPAN
12. FREQuency:SPAN?

The detailed information of each command are:

1. FREQuency	
Command Format	FREQuency {<frequency>|MINimum|MAXimum}
Function	Set the frequency of output function for CH1.
Explanations	<frequency> is the frequency value set by user, the default unit is Hz. MIN is the minimum frequency permitted by specified function, MAX is the maxmum.
Example	FREQ MIN
2. FREQuency?	
Command Format	FREQuency? [MINimum|MAXimum]
Function	Query the frequency of output function from CH1.

Return Value	The query returns the frequency value that has been set in the form of scientific notation in Hz, such as: 1.000000e-06.
3. FREQuency:CH2	
Command Format	FREQuency:CH2 {<frequency>|MINimum|MAXimum}
Function	Set the frequency of output function for CH2.
Explanations	<frequency> is the frequency value set by user, the default unit is Hz. MIN is the minimum frequency permitted by specified function, MAX is the maxmum.
Example	FREQ:CH2 MIN
4. FREQuency:CH2?	
Command Format	FREQuency:CH2? [MINimum|MAXimum]
Function	Query the frequency of output function from CH2.
Return Value	The query returns the frequency value that has been set in the form of scientific notation in Hz, such as: CH2:1.000000e-06.
5. FREQuency:STARt	
Command Format	FREQuency:STARt {<frequency>|MINimum|MAXimum}
Function	Set the start frequency (used in conjunction with the stop frequency) in sweep mode.
Example	FREQ:STAR MIN
6. FREQuency:STARt?	
Command Format	FREQuency:STARt? [MINimum|MAXimum]
Function	Query the start frequency in sweep mode.
Return Value	The query returns the start frequency that has been set in the form of scientific notation in Hz, such as: 1.000000e-06.
7. FREQuency:STOP	
Command Format	FREQuency:STOP {<frequency>|MINimum|MAXimum}
Function	Set the stop frequency (used in conjunction with start frequency)

	in sweep mode.
Example	FREQ:STOP MAX
8. FREQuency:STOP?	
Command Format	FREQuency:STOP? [MINimum|MAXimum]
Function	Query the stop frequency in sweep mode.
Return Value	The query returns the stop frequency that has been set in the form of scientific notation in Hz, such as: 2.000000e+07.
9. FREQuency:CENTer	
Command Format	FREQuency:CENTer {<frequency>|MINimum|MAXimum}
Function	Set the center frequency (used in conjunction with span frequency) in sweep mode.
Example	FREQ:CENT 10000000
10. FREQuency:CENTer?	
Command Format	FREQuency:CENTer? [MINimum|MAXimum]
Function	Query the center frequency in sweep mode.
Return Value	The query returns the center frequency that has been set in the form of scientific notation in Hz, such as: 1.000000e+07.
11. FREQuency:SPAN	
Command Format	FREQuency:SPAN {<frequency>|MINimum|MAXimum}
Function	Set the span frequency (used in conjunction with center frequency) in sweep mode.
Example	FREQ:SPAN MAX
12. FREQuency:SPAN?	
Command Format	FREQuency:SPAN? [MINimum|MAXimum]
Function	Query the span frequency in sweep mode.
Return Value	The query returns the span frequency that has been set in the form of scientific notation in Hz, such as: 2.000000e+07.

VOLTage

VOLTage commands are used for setting the voltage amplitude, offset, high level, low level, or setting the voltage unit for each channel.

DG10X2 supports following **VOLTage** commands:

1. VOLTage
2. VOLTage?
3. VOLTage:HIGH
4. VOLTage:HIGH?
5. VOLTage:LOW
6. VOLTage:LOW?
7. VOLTage:OFFSet
8. VOLTage:OFFSet?
9. VOLTage:UNIT
10. VOLTage:UNIT?
11. VOLTage:CH2
12. VOLTage:CH2?
13. VOLTage:HIGH:CH2
14. VOLTage:HIGH:CH2?
15. VOLTage:LOW:CH2
16. VOLTage:LOW:CH2?
17. VOLTage:OFFSet:CH2
18. VOLTage:OFFSet:CH2?
19. VOLTage:UNIT:CH2
20. VOLTage:UNIT:CH2?

The detailed information of each command are:

1. VOLTage	
Command Format	VOLTage {<amplitude>|MINimum|MAXimum}
Function	Set the amplitude from CH1 in Vpp.
Explanations	MIN selects the minimum amplitude. MAX selects the maximum amplitude for the selected function.
Unit	VPP, VRMS or DBM. Note that DBM could be used only in non-high resistance. The unit of voltage could be changed via sending

	VOLTage:UNIT.
Example	VOLT MIN
2. VOLTage?	
Command Format	VOLTage?
Function	Query the amplitude from CH1.
Return Value	The query returns the amplitude that has been set in the form of scientific notation such as: 4.000000e-03.
3. VOLTage:HIGH	
Command Format	VOLTage:HIGH {<voltage>|MINimum|MAXimum}
Function	Set the high level of waves from CH1 in Vpp.
Explanations	<voltage>is the high level for user to set. MIN selects the minimum high level. MAX selects the maximum high level.
Example	VOLT:HIGH MAX
4. VOLTage:HIGH?	
Command Format	VOLTage:HIGH?
Function	Query the high level of waves from CH1.
Return Value	The query returns the high level that has been set in the form of scientific notation such as: 1.000000e+01.
5. VOLTage:LOW	
Command Format	VOLTage:LOW {<voltage>|MINimum|MAXimum}
Function	Set the low level of waves from CH1 in Vpp.
Explanations	<voltage>is the low level for user to set. MIN selects the minimum low level. MAX selects the maximum low level.
Example	VOLT:LOW MIN
6. VOLTage:LOW?	
Command Format	VOLTage:LOW?
Function	Query the low level of waves from CH1.

Return Value	The query returns the low level that has been set in the form of scientific notation such as: -1.000000e+01.
7. VOLTage:OFFSet	
Command Format	VOLTage:OFFSet {<offset>|MINimum|MAXimum}
Function	Set the offset voltage of CH1 in V_{DC}.
Explanations	< offset >is the offset voltage for user to set. MIN selects the minimum DC offset voltage for specified function and amplitude. MAX selects the maximum value.
Example	VOLT:OFFS MIN
8. VOLTage:OFFSet?	
Command Format	VOLTage:OFFSet?
Function	Query the offset voltage of CH1.
Return Value	The query returns the offset voltage that has been set in the form of scientific notation such as: -9.998000e+00.
9. VOLTage:UNIT	
Command Format	VOLTage:UNIT {VPP|VRMS|DBM}
Function	Set the unit of voltage from CH1.
Explanations	DBM could be used only in non-high resistance.
Example	VOLT:UNIT VPP
10. VOLTage:UNIT?	
Command Format	VOLTage:UNIT?
Function	Query the unit of voltage from CH1.
Return Value	The query returns VPP, VRMS or DBM.
11. VOLTage:CH2	
Command Format	VOLTage:CH2 {<amplitude>|MINimum|MAXimum}
Function	Set the amplitude of CH2 in Vpp.
Explanations	MIN selects the minimum amplitude. MAX selects the maximum

	amplitude for the selected function.
Example	VPP, VRMS or DBM. Note that DBM could be used only in non-high resistance. The unit of voltage could be changed via sending **VOLTage:UNIT:CH2**.
Command Format	VOLT:CH2 MIN
12. VOLTage:CH2?	
Command Format	VOLTage:CH2?
Function	Query the amplitude of CH2.
Return Value	The query returns the amplitude that has been set in the form of scientific notation such as: CH2: 4.000000e-03.
13. VOLTage:HIGH:CH2	
Command Format	VOLTage:HIGH:CH2 {<voltage>|MINimum|MAXimum}
Function	Set the high level of waves from CH2 in Vpp.
Explanations	<voltage>is the high level for user to set. MIN selects the minimum high level. MAX selects the maximum high level.
Example	VOLT:HIGH:CH2 MAX
14. VOLTage:HIGH:CH2?	
Command Format	VOLTage:HIGH:CH2?
Function	Query the high level of waves from CH2.
Return Value	The query returns the high leve that has been set in the form of scientific notation such as: 1.500000e+00.
15. VOLTage:LOW:CH2	
Command Format	VOLTage:LOW:CH2 {<voltage>|MINimum|MAXimum}
Function	Set the low level of waves from CH2 in Vpp.
Explanations	<voltage>is the low level for user to set. MIN selects the minimum low level. MAX selects the maximum low level.
Example	VOLT:LOW:CH2 MIN

16. VOLTage:LOW:CH2?	
Command Format	VOLTage:LOW:CH2?
Function	Query the low level of waves from CH2.
Return Value	The query returns the low leve that has been set in the form of scientific notation such as: -1.500000e+00.
17. VOLTage:OFFSet:CH2	
Command Format	VOLTage:OFFSet:CH2 {<offset>|MINimum|MAXimum}
Function	Set the offset voltage from CH2 in V_{DC}.
Explanations	<offset>is the offset voltage for user to set. MIN selects the minimum DC offset voltage for specified function and amplitude. MAX selects the maximum value.
Example	VOLT:OFFS:CH2 MIN
18. VOLTage:OFFSet:CH2?	
Command Format	VOLTage:OFFSet:CH2?
Function	Query the offset voltage from CH2.
Return Value	The query returns the offset voltage that has been set in the form of scientific notation such as: -0.000000e+00.
19. VOLTage:UNIT:CH2	
Command Format	VOLTage:UNIT:CH2 {VPP|VRMS|DBM}
Function	Set the unit of voltage from CH2.
Explanations	DBM could be used only in non-high resistance.
Example	VOLT:UNIT:CH2 VPP
20. VOLTage:UNIT:CH2?	
Command Format	VOLTage:UNIT:CH2?
Function	Query the unit of voltage from CH2.
Return Value	The query returns VPP, VRMS or DBM.

OUTPut

OUTPut commands are used for setting the output parameters, such as: the output switch, the output loads, the polarity of the waveform, the synchronous output signal and the trigger output from CH1.

DG10X2 supports following **OUTPut** commands:

1. OUTPut
2. OUTPut?
3. OUTPut:LOAD
4. OUTPut:LOAD?
5. OUTPut:POLarity
6. OUTPut:POLarity?
7. OUTPut:SYNC
8. OUTPut:SYNC?
9. OUTPut:TRIGger:SLOPe
10. OUTPut:TRIGger:SLOPe?
11. OUTPut:TRIGger
12. OUTPut:TRIGger?
13. OUTPut:CH2
14. OUTPut:CH2?
15. OUTPut:LOAD:CH2
16. OUTPut:LOAD:CH2?
17. OUTPut:POLarity:CH2
18. OUTPut:POLarity:CH2?

The detailed information of each command are:

1. OUTPut	
Command Format	OUTPut {OFF|ON}
Function	Disable or enable the front-panel [Output] connector[Output] connector. The default is "OFF".
Example	OUTP ON
2. OUTPut?	
Command	OUTPut?

Format	
Function	Query the state of the [Output] connector on the front panel.
Return Value	The query returns OFF or ON.
3. OUTPut:LOAD	
Command Format	OUTPut:LOAD {<ohm>|INFinity|MINimum|MAXimum}
Function	Select the desired output termination of CH1. The specified value is only used for amplitude and offset voltage.
Explanations	● Ω is the unit of <ohm>, the default is 50Ω. ● "INFinity" sets the output terminal as "High Z".
Example	OUTP:LOAD 50
4. OUTPut:LOAD?	
Command Format	OUTPut:LOAD? [MINimum|MAXimum]
Function	Query the current load settings of CH1.
Return Value	The query returns the current load setting in ohms or returns "Infinity".
5. OUTPut:POLarity	
Command Format	OUTPut:POLarity {NORMal|INVerted}
Function	Set the polarity of waveform for CH1.
Example	OUTP:POL NORM
6. OUTPut:POLarity?	
Command Format	OUTPut:POLarity?
Function	Query the polarity of waveform from CH1.
Return Value	The query returns NORM or INV.
7. OUTPut:SYNC	
Command Format	OUTPut:SYNC {OFF|ON}
Function	Disable or enable the rear panel [Output] connector of CH1. The default is "OFF".

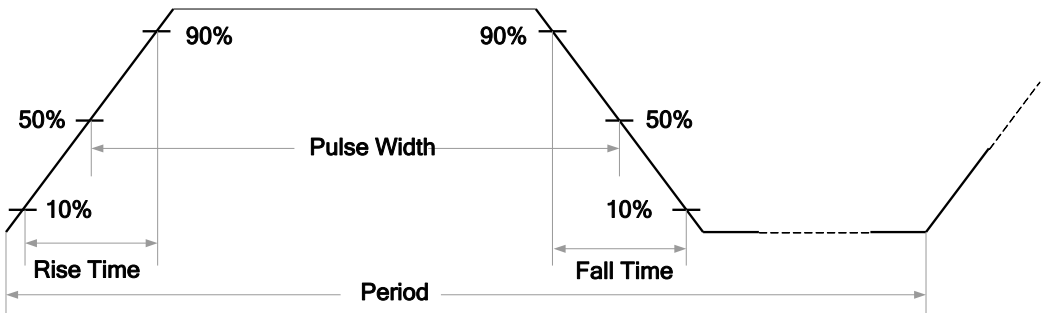
Explanations	The signal could be output synchronously only from CH1.
Example	OUTP:SYNC OFF
8. OUTPut:SYNC?	
Command Format	OUTPut:SYNC?
Function	Query the state of the [Sync Out] connector of CH1 on the rear panel. The default is "OFF".
Return Value	The query returns SYNC OFF or SYNC ON.
9. OUTPut:TRIGger:SLOPe	
Command Format	OUTPut:TRIGger:SLOPe {POSitive|NEGative}
Function	Select the edge of "tirgger output". If **OUTPut:TRIGger** command is enabled, the square wave that compatibles with TTL and within specified edge will be generated from [Ext Trig/FSK/Burst] conncetor on the rear panel as soon as you start sweeping.
Explanations	• The command is used in **Burst** and **Sweep** operation. • Select "POS" to output a pulse with a rising edge. • Select "NEG" to output a pulse with a falling edge.
Example	OUTP:TRIG:SLOP POS
10. OUTPut:TRIGger:SLOPe?	
Command Format	OUTPut:TRIGger:SLOPe?
Function	Query the edge of "tirgger output".
Return Value	The query returns POSITIVE or NEGATIVE.
11. OUTPut:TRIGger	
Command Format	OUTPut:TRIGger {OFF|ON}
Function	Disable or enable the [Ext Trig/FSK/Burst] connector on rear panel.
Example	OUTP:TRIG OFF
12. OUTPut:TRIGger?	
Command	OUTPut: TRIGger?

Format	
Function	Query the state of the [Ext Trig/FSK/Burst] connector on rear panel.
Return Value	The query returns OFF or ON.
13. OUTPut:CH2	
Command Format	OUTPut:CH2 {OFF|ON}
Function	Disable or enable the front-panel [Output] connector of CH2.
Example	OUTP:CH2 ON
14. OUTPut:CH2?	
Command Format	OUTPut:CH2?
Function	Query the state of front-panel [Output] connector of CH2.
Return Value	The query returns OFF or ON.
15. OUTPut:LOAD:CH2	
Command Format	OUTPut:LOAD:CH2 {<ohm>|INFinity|MINimum|MAXimum}
Function	Select the desired output termination of CH2. The specified value is only used for amplitude and offset voltage.
Explanations	● Ω is the unit of <ohm>, the default is 50Ω. ● "INFinity" sets the output terminal as "High Z".
Example	OUTP:LOAD:CH2 MIN
16. OUTPut:LOAD:CH2?	
Command Format	OUTPut:LOAD:CH2? [MINimum|MAXimum]
Function	Query the current load settings of CH2.
Return Value	The query returns the current load setting in ohms or returns "Infinity".
17. OUTPut:POLarity:CH2	
Command Format	OUTPut:POLarity:CH2 {NORMal|INVerted}
Function	Set the polarity of waveform from CH2.
Example	OUTP:POL:CH2 NORM

18. OUTPut:POLarity:CH2?	
Command Format	OUTPut:POLarity:CH2?
Function	Query the polarity of waveform from CH2.
Return Value	The query returns NORM or INV.

PULSe

PULSe commands are used for configuring the parameters of pulse waves from dual channels such as: period, pulse width, duty cycle and others. Following figure is going to help you comprehend the parameters about pulse wave.



DG10X2 supports following **PULSe** commands:

1. PULSe:PERiod
2. PULSe:PERiod?
3. PULSe:WIDTh
4. PULSe:WIDTh?
5. PULSe:DCYCle
6. PULSe:DCYCle?
7. PULSe:PERiod:CH2
8. PULSe:PERiod:CH2?
9. PULSe:WIDTh:CH2
10. PULSe:WIDTh:CH2?
11. PULSe:DCYCle:CH2
12. PULSe:DCYCle:CH2?

The detailed information of each command are:

1. PULSe:PERiod	
Command Format	PULSe:PERiod {<seconds>|MINimum|MAXimum}
Function	Set the period of pulse from CH1 in seconds.
Example	PULS:PER 0.01

2. PULSe:PERiod?	
Command Format	PULSe:PERiod? [MINimum|MAXimum]
Function	Query the period of pulse from CH1.
Return Value	The query returns the period of pulse in the form of scientific notation and in seconds, such as: 1.000000e-02.
3. PULSe:WIDTh	
Command Format	PULSe:WIDTh {<seconds>|MINimum|MAXimum}
Function	Set the width of pulse for CH1 in seconds.
Example	PULS:WIDT 0.005
4. PULSe:WIDTh?	
Command Format	PULSe:WIDTh? [MINimum|MAXimum]
Function	Query the width of pulse from CH1.
Return Value	The qurey returns the width of pulse in the form of scientific notation and in seconds, such as: 5.000000e-03.
5. PULSe:DCYCle	
Command Format	PULSe:DCYCle {<percent>|MINimum|MAXimum}
Function	Set the duty cycle of pulse for CH1.
Example	PULS:DCYC 50
6. PULSe:DCYCle?	
Command Format	PULSe:DCYCle? [MINimum|MAXimum]
Function	Query the duty cycle of pulse from CH1.
Return Value	The qurey returns the percent of duty cycle of pulse in the form of scientific notation such as: 5.000000e+01.
7. PULSe:PERiod:CH2	
Command Format	PULSe:PERiod:CH2 {<seconds>|MINimum|MAXimum}
Function	Set the period of pulse for CH2 in seconds.

Example	PULS:PER:CH2 0.01
8. PULSe:PERiod:CH2?	
Command Format	PULSe:PERiod:CH2? [MINimum|MAXimum]
Function	Query the period of pulse from CH2.
Return Value	The qurey returns the period of pulse in the form of scientific notation and in seconds, such as: 1.000000e-02.
9. PULSe:WIDTh:CH2	
Command Format	PULSe:WIDTh:CH2 {<seconds>|MINimum|MAXimum}
Function	Set the pulse width for CH2 in seconds.
Example	PULS:WIDT:CH2 0.005
10. PULSe:WIDTh:CH2?	
Command Format	PULSe:WIDTh:CH2? [MINimum|MAXimum]
Function	Query the pulse width from CH2.
Return Value	The qurey returns the pulse width in the form of scientific notation and in seconds, such as: 5.000000e-03.
11. PULSe:DCYCle:CH2	
Command Format	PULSe:DCYCle:CH2 {<percent>|MINimum|MAXimum}
Function	Set the duty cycle of pulse from CH2.
Example	PULS:DCYC:CH2 50
12. PULSe:DCYCle:CH2?	
Command Format	PULSe:DCYCle:CH2? [MINimum|MAXimum]
Function	Query the duty cycle of pulse from CH2.
Return Value	The qurey returns the percent of duty cycle in the form of scientific notationn and in seconds, such as: 5.000000e+01.

AM

In AM, the amplitude of carrier is varies with the instantaneous voltage of the modulation waveform. Among CH1, the generator can generate AM modulation waves. In addition, **AM** commands could be used for these settings: modulation source, modulation waveform, modulation frequency, modulation depth and AM modulation state.

DG10X2 supports following **AM** commands:

1. AM:SOURce
2. AM:SOURce?
3. AM:INTernal:FUNCtion
4. AM:INTernal:FUNCtion?
5. AM:INTernal:FREQuency
6. AM:INTernal:FREQuency?
7. AM:DEPTh
8. AM:DEPTh?
9. AM:STATe
10. AM:STATe?

The detailed information of each command are:

1. AM:SOURce	
Command Format	AM:SOURce {INTernal|EXTernal}
Function	Select internal or external modulation source, the default is INT.
Example	AM:SOUR EXT
2. AM:SOURce?	
Command Format	AM:SOURce?
Function	Query the modulation source of AM.
Return Value	The query returns INT or EXT.
3. AM:INTernal:FUNCtion	
Command	AM:INTernal:FUNCtion

Format	{SINusoid|SQUare|RAMP|NRAMp|TRIangle|NOISe|USER}
Function	Select the internal modulation source of AM.
Explanations	In internal modulation source mode, the modulation wave could be sine, square, ramp, negative ramp, triangle, noise or arbitrary wave, the default is sine.
Example	AM:INT:FUNC SQU
4. AM:INTernal:FUNCtion?	
Command Format	AM:INTernal:FUNCtion?
Function	Query the internal modulation wave of AM that has been selected.
Return Value	The query returns SIN, SQU, RAMP, NRAM, TRI, NOIS or USER.
5. AM:INTernal:FREQuency	
Command Format	AM:INTernal:FREQuency {<frequency>|MINimum|MAXimum}
Function	Set the frequency of internal modulation of AM in Hz.
Explanations	Frequency range: 2mHz～20kHz
Example	AM:INT:FREQ 200
6. AM:INTernal:FREQuency?	
Command Format	AM:INTernal:FREQuency?
Function	Query the frequency of internal modulation of AM.
Return Value	The query returns the percent of the frequency of AM internal modulation in the form of scientific notation, such as: 2.000000e+02.
7. AM:DEPTh	
Command Format	AM:DEPTh {<depth percent>|MINimum|MAXimum}
Function	Set the depth of internal modulation of AM in percent.
Explanations	Depth range: 0%～120%
Example	AM:DEPT 70
8. AM:DEPTh?	
Command	AM:DEPTh? [MINimum|MAXimum]

Format	
Function	Query the depth of internal modulation of AM.
Return Value	The qurey returns the percent of the depth of AM internal modulation in the form of scientific notation, such as: 7.000000e+01.
9. AM:STATe	
Command Format	AM:STATe {OFF|ON}
Function	Disable or enable AM function.
Example	AM:STAT OFF
10. AM:STATe?	
Command Format	AM:STATe?
Function	Query the modulation state of AM.
Return Value	The query returns OFF or ON.

FM

In FM, the frequency of carrier is varies with the instantaneous voltage of the modulation waveform. Among CH1, the generator can generate FM modulated waves. In addition, **FM** commands could be used for these settings: modulation source, modulation waveform, modulation frequency, frequency deviation of peak value and FM modulation state.

DG10X2 supports following **FM** commands:

1. FM:SOURce
2. FM:SOURce?
3. FM:INTernal:FUNCtion
4. FM:INTernal:FUNCtion?
5. FM:INTernal:FREQuency
6. FM:INTernal:FREQuency?
7. FM:DEViation
8. FM:DEViation?
9. FM:STATe
10. FM:STATe?

The detailed information of each command are:

1. FM:SOURce	
Command Format	FM:SOURce {INTernal|EXTernal}
Function	Select internal or external modulation source, the default is INT.
Example	FM:SOUR EXT
2. FM:SOURce?	
Command Format	FM:SOURce?
Function	Query the modulation source of FM.
Return Value	The query returns INT or EXT.
3. FM:INTernal:FUNCtion	
Command	FM:INTernal:FUNCtion

Format	{SINusoid|SQUare|RAMP|NRAMp|TRIangle|NOISe|USER}
Function	Select the internal modulation wave of FM.
Explanations	In internal modulation source mode, the modulation wave could be sine, square, ramp, negative ramp, triangle, noise or arbitrary wave, the default is sine.
Example	FM:INT:FUNC SQU
4. FM:INTernal:FUNCtion?	
Command Format	FM:INTernal:FUNCtion?
Function	Query the internal modulation wave of FM that has been selected.
Return Value	The query returns SIN, SQU, RAMP, NRAM, TRI, NOIS or USER.
5. FM:INTernal:FREQuency	
Command Format	FM:INTernal:FREQuency {<frequency>|MINimum|MAXimum}
Function	Set the frequency of internal modulation of FM in Hz.
Explanations	Frequency range: 2mHz～20kHz
Example	FM:INT:FREQ 200
6. FM:INTernal:FREQuency?	
Command Format	FM:INTernal:FREQuency?
Function	Query the frequency of internal modulation of FM.
Return Value	The query returns the percent of the frequency of FM internal modulation in the form of scientific notation, such as: 2.000000e+02
7. FM:DEViation	
Command Format	FM:DEViation{<frequency deviation of peak value> |MINimum|MAXimum}
Function	Set the frequency deviation of peak value of FM in Hz.
Example	FM:DEV 100
8. FM:DEViation?	
Command Format	FM:DEViation? [MINimum|MAXimum]

Function	Query the frequency deviation of peak value of FM.
Return Value	The query returns the frequency deviation of peak value of FM in the form of scientific notation and in Hz, such as: 1.000000e+02
9. FM:STATe	
Command Format	FM:STATe {OFF|ON}
Function	Disable or enable FM function.
Example	FM:STAT OFF
10. FM:STATe?	
Command Format	FM:STATe?
Function	Query the modulation state of FM.
Return Value	The query returns OFF or ON.

PM

In PM, the phase of carrier is varies with the instantaneous voltage of the modulation waveform. Among CH1, the generator can generate PM modulation waves. In addition, **PM** commands could be used for these settings: modulation source, modulation waveform, modulation frequency, phase deviation and PM modulation state.

DG10X2 supports following **PM** commands:

1. PM:SOURce
2. PM:SOURce?
3. PM:INTernal:FUNCtion
4. PM:INTernal:FUNCtion?
5. PM:INTernal:FREQuency
6. PM:INTernal:FREQuency?
7. PM:DEViation
8. PM:DEViation?
9. PM:STATe
10. PM:STATe?

The detailed information of each command are:

1. PM:SOURce	
Command Format	PM:SOURce {INTernal|EXTernal}
Function	Select internal or external modulation source, the default is INT.
Example	PM:SOUR EXT
2. PM:SOURce?	
Command Format	PM:SOURce?
Function	Query the modulation source of PM.
Return Value	The query returns INT or EXT.
3. PM:INTernal:FUNCtion	
Command Format	PM:INTernal:FUNCtion {SINusoid|SQUare|RAMP|NRAMp|TRIangle|NOISe|USER}

Function	Select the internal modulation wave of PM.
Explanations	In internal modulation source mode, the modulation wave could be sine, square, ramp, negative ramp, triangle, noise or arbitrary wave, the default is sine.
Example	PM:INT:FUNC SQU
4. PM:INTernal:FUNCtion?	
Command Format	PM:INTernal:FUNCtion?
Function	Query the internal modulation wave of PM that has been selected.
Return Value	The query returns SIN, SQU, RAMP, NRAM, TRI, NOIS or USER.
5. PM:INTernal:FREQuency	
Command Format	PM:INTernal:FREQuency {<frequency>|MINimum|MAXimum}
Function	Set the frequency of internal modulation of PM and in Hz.
Explanations	Frequency range: 2mHz～20kHz
Example	PM:INT:FREQ 200
6. PM:INTernal:FREQuency?	
Command Format	PM:INTernal:FREQuency?
Function	Query the frequency of internal modulation of PM.
Return Value	The query returns the internal modulation frequency of PM in the form of scientific notation, such as: 2.000000e+02.
7. PM:DEViation	
Command Format	PM:DEViation {<phase deviation>|MINimum|MAXimum}
Function	Set the phase deviation of PM and in degree.
Explanations	Phase deviation range: 0°～360°
Example	PM:DEV 180
8. PM:DEViation?	
Command Format	PM:DEViation? [MINimum|MAXimum]
Function	Query the phase deviation of PM.

Return Value	The query returns the phase deviation of PM in the form of scientific notation in degree, such as: 1.800000e+02.
9. PM:STATe	
Command Format	PM:STATe {OFF|ON}
Function	Disable or enable PM function.
Example	PM:STAT OFF
10. PM:STATe?	
Command Format	PM:STATe?
Function	Query the modulation state of PM.
Return Value	The query returns OFF or ON.

FSKey

In FSK modulation, you can configure the generator to "shift" its output frequency between two preset frequencies (called the "carrier frequency" and the "hop frequency") from CH1. The output frequency that shifts from the carrier frequency to the hop frequency is called "FSK rate". FSK rate is determined by internal frequency generator or signal level which is inputted from the [Ext Trig/FSK/Burst] connector on the rear panel.

To generate a FSK waveform, you have to configure the carrier wave, choose the modulation source, select the "hop frequency" and the FSK rate, and then enable the FSK modulation.

DG10X2 supports following **FSK** commands:

1. FSK:SOURce
2. FSK:SOURce?
3. FSK:FREQuency
4. FSK:FREQuency?
5. FSK:INTernal:RATE
6. FSK:INTernal:RATE?
7. FSK:STATe
8. FSK:STATe?

The detailed information of each command are:

1. FSK:SOURce	
Command Format	FSK:SOURce {INTernal|EXTernal}
Function	Select internal or external modulation source, the default is INT.
Example	FSK:SOUR EXT
2. FSK:SOURce?	
Command Format	FSK:SOURce?
Function	Query the modulation source of FSK.
Return Value	The query returns INT or EXT.

3. FSK:FREQuency	
Command Format	FSK:FREQuency {<frequency>|MINimum|MAXimum}
Function	Set the hop frequency of FSK in Hz.
Example	FSK:FREQ 10
4. FSK:FREQuency?	
Command Format	FSK:FREQuency?
Function	Query the frequency hopping rate of FSK.
Return Value	The query returns the frequency hopping rate of FSK in the form of scientific notation, such as: 1.000000e+01.
5. FSK:INTernal:RATE	
Command Format	FSK:INTernal:RATE {<rate>|MINimum|MAXimum}
Function	Set the rate at which the output frequency "shifts" between the carrier and frequency hop, the unit is Hz.
Explanations	Rate range: 2mHz～50kHz
Example	FSK:INT:RATE 100
6. FSK:INTernal:RATE?	
Command Format	FSK:INTernal:RATE?
Function	Query the rate of FSK.
Return Value	The query returns the rate of FSK in the form of scientific notation, such as: 1.000000e+02.
7. FSK:STATe	
Command Format	FSK:STATe {OFF|ON}
Function	Disable or enable FSK function.
Example	FSK:STAT OFF
8. FSK:STATe?	
Command	FSK:STATe?

Format	
Function	Query the modulation state of FSK.
Return Value	The query returns OFF or ON.

SWEep

In frequency sweep mode, the generator "steps" from the start frequency to the stop frequency at a sweep rate that you specified. You can sweep up or down in frequency, and with either linear or logarithmic spacing.

In addition, you can configure the generator to output a single sweep (one pass from start frequency to stop frequency) by applying an external or manual trigger. The generator can produce a frequency sweep for sine, square, ramp or arbitrary waveforms (pulse, noise, and DC are not allowed) from CH1.

DG10X2 supports following **SWEep** commands:

1. SWEep:SPACing
2. SWEep:SPACing?
3. SWEep:TIME
4. SWEep:TIME?
5. SWEep:STATe
6. SWEep:STATe?

The detailed information of each command are:

1. SWEep:SPACing	
Command Format	SWEep:SPACing {LINear|LOGarithmic}
Function	Select linear or logarithmic spacing for the sweep, the default is Linear.
Example	SWE:SPAC LIN
2. SWEep:SPACing?	
Command Format	SWEep:SPACing?
Function	Query current sweep mode.
Return Value	The query returns LINEAR or LOG.
3. SWEep:TIME	
Command Format	SWEep:TIME {<seconds>|MINimum|MAXimum}

Function	Set the sweep time expected from the start frequency to the stop frequency, the default time is 1 s.
Explanations	<seconds> is the sweep time, the unit is s. MIN=1ms, MAX＝500s。
Example	SWE:TIME 10
4. SWEep:TIME?	
Command Format	SWEep:TIME?
Function	Query the sweep time expected from the start frequency to the stop frequency.
Return Value	The query returns the sweep time in the form of scientific notation in seconds such as: 1.000000e+01.
5. SWEep:STATe	
Command Format	SWEep:STATe {OFF|ON}
Function	Disable or enable the sweep mode.
Example	SWE:STAT OFF
6. SWEep:STATe?	
Command Format	SWEep:STATe?
Function	Query the sweep state.
Return Value	The query returns OFF or ON.

TRIGger

TRIGger commands are available in **Sweep** and **Burst** mode for CH1 only.

DG10X2 supports following **TRIGger** commands:

1. TRIGger:SOURce
2. TRIGger:SOURce?
3. TRIGger:SLOPe
4. TRIGger:SLOPe?
5. TRIGger:DELay
6. TRIGger:DELay?

The detailed information of each command are:

1. TRIGger:SOURce	
Command Format	TRIGger:SOURce {IMMediate|EXTernal|BUS}
Function	Select the trigger source for generator, such as: internal trigger (IMM), external trigger (EXT) from the [Ext Trig/FSK/Burst] connector on the rear panel, or manual trigger (BUS). The default is IMM.
Example	TRIG:SOUR EXT
2. TRIGger:SOURce?	
Command Format	TRIGger:SOURce?
Function	Query the trigger source of generator.
Return Value	The query returns IMM, EXT or BUS.
3. TRIGger:SLOPe	
Command Format	TRIGger:SLOPe {POSitive|NEGative}
Function	Select whether the generator uses rising edge(POS) or falling edge(NEG) of the trigger signal inputted from the [Ext Trig/FSK/Burst] connector on the rear panel. The default is POS (rising edge).

Explanations	This command could be used only when **OUTPut:TRIGger** is enabled.
Example	TRIG:SLOP POS
4. TRIGger:SLOPe?	
Command Format	TRIGger:SLOPe?
Function	Query the edge of trigger signal that has been selected.
Return Value	The query returns POSITIVE or NEGATIVE.
5. TRIGger:DELay	
Command Format	TRIGger:DELay {<second>|MINimum|MAXimum}
Function	Set the trigger delay in seconds. Note: this command is only applied to Burst mode.
Example	TRIG:DEL 0.000005
6. TRIGger:DELay?	
Command Format	TRIGger:DELay?
Function	Query the trigger delay.
Return Value	The query returns the selected delay time in the form of scientific notation in seconds, such as: 5.000000e-06.

BURSt

BURSt commands are used for setting the generator to output pulse sequence(called burst) with specified cycles. Among CH1, burst could be generated based on sine, square, ramp, burst or arbitrary waves.

DG10X2 supports following **BURSt** commands:DG10X2:

1. BURSt:MODE
2. BURSt:MODE?
3. BURSt:NCYCles
4. BURSt:NCYCles?
5. BURSt:INTernal:PERiod
6. BURSt:INTernal:PERiod?
7. BURSt:PHASe
8. BURSt:PHASe?
9. BURSt:STATe
10. BURSt:STATe?
11. BURSt:GATE:POLarity
12. BURSt:GATE:POLarity?

The detailed information of each command are:

1. BURSt:MODE	
Command Format	BURSt:MODE {TRIGgered|GATed}
Function	Select the burst mode.
Explanations	● In **TRIG** mode, the generator outputs a wave with specified cycle number once receive an assigned trigger via sending **TRIGger:SOURce**. ● In **GAT** mode, the output state of waves ("ON" or "OFF") depends on the external level used by [Ext Trig/FSK/Burst] connector on the rear panel. ● The default burst mode is TRIG.
Example	BURS:MODE GAT
2. BURSt:MODE?	
Command	BURSt:MODE?

Format	
Function	Query the burst mode.
Return Value	The query returns TRIG or GAT.
3. BURSt:NCYCles	
Command Format	BURSt:NCYCles {<cycle>|INFinity|MINimum|MAXimum}
Function	Set the cycle number of burst (only used in **TRIG** mode).
Explanations	● <cycle> is the cycle number for user to set. ● MIN=1 cycle, MAX=50,000 cycles, INF is infinite number of cycles.
Example	BURS:NCYC 100
4. BURSt:NCYCles?	
Command Format	BURSt:NCYCles?
Function	Query the cycle number of burst.
Return Value	The query returns the burst counting in the form of scientific notation such as 1.000000e+02 or returns "Infinite".
5. BURSt:INTernal:PERiod	
Command Format	BURSt:INTernal:PERiod {<秒>|MINimum|MAXimum}
Function	Set the period of burst in internal trigger mode.
Explanations	● <second> is the burst period for user to set, the unit is s. ● MIN=1μs, MAX=500s.
Example	BURS:INT:PER 10
6. BURSt:INTernal:PERiod?	
Command Format	BURSt:INTernal:PERiod? [MINimum|MAXimum]
Function	Query the period of burst in internal trigger mode.
Return Value	The query returns the burst period in the form of scientific notation such as: 1.000000e+01.
7. BURSt:PHASe	
Command	BURSt:PHASe {<angle>|MINimum|MAXimum}

Format	
Function	Set the initial phase of burst.
Explanations	● <angle> is the phase for user to set, the unit is degree. ● MIN=-180°, MAX=180°.
Example	BURS:PHAS 150
8. BURSt:PHASe?	
Command Format	BURSt:PHASe? [MINimum|MAXimum]
Function	Query the initial phase of burst.
Return Value	The query returns the initial phase of burst in the form of scientific notation in degree such as: 1.500000e+02.
9. BURSt:STATe	
Command Format	BURSt:STATe {OFF|ON}
Function	Enable or disable burst mode.
Example	BURS:STAT OFF
10. BURSt:STATe?	
Command Format	BURSt:STATe?
Function	Query the state of burst mode.
Return Value	The query returns OFF or ON.
11. BURSt:GATE:POLarity	
Command Format	BURSt:GATE:POLarity {NORMal|INVerted}
Function	Set the polarity of external gating signal from [Ext Trig/FSK/Burst] conncetor on the rear panel, the default is NORMal.
Example	BURS:GATE:POL INV
12. BURSt:GATE:POLarity?	
Command Format	BURSt:GATE:POLarity?
Function	Query the polarity of external gating signal from the rear panel.
Return Value	The query returns NORM or INV.

DATA

DATA commands are usd for editing or saving arbitrary waves and outputing those waves via CH1. You can store ten user-defined waveforms at most in non-volatile memory in addition to one in volatile memory. Each waveform can contain data points within 1 and 524,288 (512k).

DG10X2 supports following **DATA** commands:

1. DATA
2. DATA:DAC
3. DATA:COPY
4. DATA:DELete
5. DATA:CATalog?
6. DATA:RENAME
7. DATA:NVOLatile:CATalog?
8. DATA:NVOLatile:FREE?
9. DATA:ATTRibute:POINts?
10. DATA:LOAD

The detailed information of each command are:

1. DATA	
Command Format	DATA VOLATILE,<value>, <value>, . . .
Function	Load the floating point numbers between -1 and 1 into volatile memory.
Explanations	• **DATA** command may cover a previous waveform in volatile memory (does not generate error). • Use **DATA:COPY** command to copy the waveform to non-volatile memory. • Use **DATA:DELete** command to delete the waveform in volatile memory or any of the ten user-defined waveforms in nonvolatile memory. • Use **DATA:CATalog?** command to list all waveforms currently stored in volatile and non-volatile memory. • Use **FUNCtion:USER** command to output the waves that has been edited and stored after downloading the waveform data

	to memory.
Example	DATA VOLATILE,1,0.67,0.33,0,-0.33,-0.67,-1
2. DATA:DAC	
Command Format	DATA:DAC VOLATILE,<value>, <value>, . . .
Function	Download decimal integer values from 0 to 16383 into volatile memory.
Explanations	• **DATA:DAC** command may cover a previous waveform in volatile memory (does not generate error). • Use **DATA:COPY** command to copy the waveform to non-volatile memory. • Use **DATA:DELete** command to delete the waveform in volatile memory or any of the ten user-defined waveforms in nonvolatile memory. • Use **DATA:CATalog?** command to list all waveforms currently stored in volatile and non-volatile memory. • Use **FUNCtion:USER** command to output the waves that has been edited and stored after downloading the waveform data to memory.
Example	DATA:DAC VOLATILE,8192,16383,8192,0
3. DATA:COPY	
Command Format	DATA:COPY < destination arb name >[,VOLATILE]
Function	Copy the waveform from volatile memory to the specified non-volatile memory.
Explanations	• The arb name may contain up to 12 characters. The first character must be a letter (A-Z or a-z), the remaining characters can be numbers (0-9) or the underscore character ("_"). Blank space is invalid. • The VOLATILE parameter is optional and can be omitted. Note that the keyword "VOLATILE" does not have a short form. • Use **DATA:DELete** command to delete the waveform in volatile memory or any of the ten user-defined waveforms in non-volatile memory. • Use **DATA:CATalog?** command to list all waveforms currently

	stored in volatile and non-volatile memory.
Example	DATA:COPY a1,VOLATILE
4. DATA:DELete	
Command Format	DATA:DELete <arb name>
Function	Delete the specified arbitrary waveform from either volatile memory or non-volatile memory.
Example	DATA:DEL a1
5. DATA:CATalog?	
Command Format	DATA:CATalog?
Function	Query the names of all waveforms currently available for selection.
Return Value	The query returns the names of the five built-in waveforms (non-volatile memory), "VOLATILE" (if a waveform is currently downloaded to volatile memory), and all user-defined waveforms downloaded to non-volatile memory, such as: "VOLATILE","EXP_RISE","EXP_FALL","NEG_RAMP", "SINC", "CARDIAC","A","B","C","D","E","F","G","H","I","J".
6. DATA:RENAME	
Command Format	DATA:RENAME <destination arb name>,<new arb name>
Function	Rename an arbitrary wave.
Example	DATA:RENAME old, new
7. DATA:NVOLatile:CATalog?	
Command Format	DATA:NVOLatile:CATalog?
Function	Query the names of all user-defined arbitrary waveforms downloaded to non-volatile memory.
Return Value	The query returns the quoted names of up to 10 waveforms such as: "A","B","C","D","E","F","G","H","I","J".
8. DATA:NVOLatile:FREE?	
Command	DATA:NVOLatile:FREE?

Format	
Function	Query the number of non-volatile memory that is available for saving user-defined waveforms.
Return Value	The query returns 0 (denotes full memory), 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.
9. DATA:ATTRibute:POINts?	
Command Format	DATA:ATTRibute:POINts? <destination arb name>
Function	Query the number of points in the specified arbitrary waveform.
Return Value	The query return a value within 0~524,288, such as 4096.
10. DATA:LOAD	
Command Format	DATA:LOAD [<destination arb name>]
Function	Upload the specified arbitrary wave to the application software.

MEMory

The generator has 10 storage locations in non-volatile memory (STATE1~ STATE10) to store instrument states. The locations are numbered from 0 to 10. The generator automatically uses location "0" to hold the state of the instrument when power down. You can also assign a user-defined name to each of the locations (1 through 10) from the front panel.

DG10X2 supports following **MEMory** commands:

1. MEMory:STATe:NAME
2. MEMory:STATe:NAME?
3. MEMory:STATe:DELete
4. MEMory:STATe:RECall:AUTO
5. MEMory:STATe:RECall:AUTO?
6. MEMory:STATe:VALid?
7. MEMory:NSTates?

The detailed information of each command are:

1. MEMory:STATe:NAME	
Command Format	MEMory:STATe:NAME {0|1|2|3|4|5|6|7|8|9|10} [,<name>]
Function	Assign an user-defined name for specified memory location.
Example	MEM:STAT:NAME 1,A1
2. MEMory:STATe:NAME?	
Command Format	MEMory:STATe:NAME? {0|1|2|3|4|5|6|7|8|9|10}
Function	Query the name of specified memory location.
Return Value	The query returns the name of specified memory location such as A1. If no name was assigned, the return is empty.
3. MEMory:STATe:DELete	
Command Format	MEMory:STATe:DELete {0|1|2|3|4|5|6|7|8|9|10}
Function	Delete the contents in specified memory location.

Example	MEM:STAT:DEL 1
4. MEMory:STATe:RECall:AUTO	
Command Format	MEMory:STATe:RECall:AUTO {OFF| ON}
Function	Disable or enable the automatic recall of the power-down state from storage location "0" when power on. Select "ON" to automatically recall power-down state when power on and select "OFF" (default) to issue a reset.
Example	MEM:STAT:REC:AUTO OFF
5. MEMory:STATe:RECall:AUTO?	
Command Format	MEMory:STATe:RECall:AUTO?
Function	Query the recall state when power off.
Return Value	The query returns OFF or ON.
6. MEMory:STATe:VALid?	
Command Format	MEMory:STATe:VALid? {0|1|2|3|4|5|6|7|8|9|10}
Function	Query the specified storage location to determine if a valid state has already been stored in that location.
Return Value	Return "0" if no state has been stored or if it has been deleted. or else return "1".
7. MEMory:NSTates?	
Command Format	MEMory:NSTates?
Function	Query the total number of memory locations available for state storage.
Return Value	Always returns "11" (including memory location "0").

SYSTem

SYSTem commands provide information about state storage, power-down recall, error state and screen control of the front panel and other information about the instrument.

DG10X2 supports following **SYSTem** commands:

1. SYSTem:ERRor?
2. SYSTem:VERSion?
3. SYSTem:BEEPer:STATe
4. SYSTem:BEEPer:STATe?
5. SYSTem:LOCal
6. SYSTem:RWLock
7. SYSTem:REMote
8. SYSTem:CLKSRC
9. SYSTem:LANGuage

The detailed information of each command are:

1. SYSTem:ERRor?	
Command Format	SYSTem:ERRor?
Function	Read and clear an error from error queues.
Return Value	The query returns an error information with following format: -118,"Invalid parameter"
2. SYSTem:VERSion?	
Command Format	SYSTem:VERSion?
Function	Query current edition of the instrument.
Return Value	The query returns the character string with following format: 00.01.00.04.00.02.03
3. SYSTem:BEEPer:STATe	
Command Format	SYSTem:BEEPer:STATe {OFF|ON}

Function	Enable or disable the beep when error occurs on front panel or remote interface.
Example	SYST:BEEP:STAT OFF
4. SYSTem:BEEPer:STATe?	
Command Format	SYSTem:BEEPer:STATe?
Function	Query the state of beeper.
Return Value	The query returns 0 (OFF) or 1 (ON).
5. SYSTem:LOCal	
Command Format	SYSTem:LOCal
Function	Activate local state and delete RMT indicator and unlock the front panel.
6. SYSTem:RWLock	
Command Format	SYSTem:RWLock
Function	Activate remote state with locking function and display R-LOCK indicator and lock the keyboard. (including Local button)
7. SYSTem:REMote	
Command Format	SYSTem:REMote
Function	Activate remote state and display RMT indicator and lock the keyboard. (except for Local button)
8. SYSTem:CLKSRC	
Command Format	SYSTem:CLKSRC {EXT|INT}
Function	Select the system clock source as internal or external, the default is INT.
Explanations	When external clock source is actived, the system accepts the clock source from [10 MHz In] connector on the rear panel.
Example	SYST:CLKSRC EXT

9. SYSTem:LANGuage	
Command Format	SYSTem:LANGuage {CHINESE|ENGLISH}
Function	Select the system language as Chinese or English.
Example	SYST:LANG CHINESE

PHASe

PHASe commands are used for setting the initial phase of signals from each channel and controlling the dual channels phase output synchronously.

DG10X2 supports following **PHASe** commands:

1. PHASe
2. PHASe?
3. PHASe:CH2
4. PHASe:CH2?
5. PHASe:ALIGN

The detailed information of each command are:

1. PHASe	
Command Format	PHASe {<angle>|MINimum|MAXimum}
Function	Set the initial phase of signals from CH1.
Explanations	<angle> is the phase for user to set, the unit is degree. MIN=-180°, MAX=180°。
Return Value	PHAS 90
2. PHASe?	
Command Format	PHASe? [MINimum|MAXimum]
Function	Query the initial phase of signals from CH1.
Return Value	The query returns any numerical value between -180 and 180, such as: 90.000.
3. PHASe:CH2	
Command Format	PHASe:CH2 {<angle>|MINimum|MAXimum}
Function	Set the initial phase of signals from CH2.
Explanations	<angle> is the phase for user to set, the unit is degree. MIN=-180°, MAX=180°。
Return Value	PHAS:CH2 90

4. PHASe:CH2?	
Command Format	PHASe:CH2? [MINimum|MAXimum]
Function	Query the initial phase of signals from CH2.
Return Value	The query returns any numerical value between -180 and 180, such as: 90.000.
5. PHASe:ALIGN	
Command Format	PHASe:ALIGN
Function	Enable the dual channels output phase synchronously.

DISPlay

DISPlay commands are used for controlling the display of front panel.

DG10X2 supports following **DISPlay** commands:

1. DISPlay
2. DISPlay?
3. DISPlay:CONTRAST
4. DISPlay:LUMInance

The detailed information of each command are:

1. DISPlay	
Command Format	DISPlay {OFF|ON}
Function	Enable or disable the display function of front panel.
Example	DISP OFF
2. DISPlay?	
Command Format	DISPlay?
Function	Query the state of screen.
Return Value	The query returns ON or OFF.
3. DISPlay:CONTRAST	
Command Format	DISPlay:CONTRAST <value>
Function	Set the contrast of display within 0~31.
Example	DISP:CONTRAST 25
4. DISPlay:LUMInance	
Command Format	DISPlay:LUMInance <value>
Function	Set the luminance of display within 0~31.
Example	DISP:LUMI 25

COUPling

COUPling commands are used for channel coupling or copying.

DG10X2 supports following **COUPling** commands:

1. COUPling
2. COUPling?
3. COUPling:BASEdchannel
4. COUPling:BASEdchannel?
5. COUPling:PHASEDEViation
6. COUPling:PHASEDEViation?
7. COUPling:FREQDEViation
8. COUPling:FREQDEViation?
9. COUPling:CHANNCopy

The detailed information of each command are:

1. COUPling	
Command Format	COUPling {OFF|ON}
Function	Enable or disable coupling function.
Example	COUP OFF
2. COUPling?	
Command Format	COUPling?
Function	Query the coupling state.
Return Value	The query returns OFF or ON.
3. COUPling:BASEdchannel	
Command Format	COUPling:BASEdchannel{:CH1|:CH2}
Function	Select the base channel while coupling channels.
Example	COUP:BASE:CH1
4. COUPling:BASEdchannel?	

Command Format	COUPling:BASEdchannel?
Function	Query the base channe that has been selected.
Return Value	The query returns CH1 or CH2.
5. COUPling:PHASEDEViation	
Command Format	COUPling:PHASEDEViation <value>
Function	Set the phase deviation, the unit is degree.
Explanations	<value>: -180°~180°
Example	COUP:PHASEDEV 10
6. COUPling:PHASEDEViation?	
Command Format	COUPling:PHASEDEViation?
Function	Query the phase deviation.
Return Value	The query returns the phase deviation in the form of scientific notation, such as: 1.000000e+01.
7. COUPling:FREQDEViation	
Command Format	COUPling:FREQDEViation <value>
Function	Set the frequency deviation in Hz.
Explanations	<value>: 0Hz~20MHz
Example	COUP:FREQDEV 100
8. COUPling:FREQDEViation?	
Command Format	COUPling:FREQDEViation?
Function	Query the frequency deviation.
Return Value	The query returns the frequency deviation in the form of scientific notation, such as: 1.000000e+02.
9. COUPling:CHANNCopy	
Command Format	COUPling:CHANNCopy {1>2|2>1}
Function	Copy CH1 to CH2 or copy CH2 to CH1.

Example	COUP:CHANNC 1>2

Chapter 3 Application Examples

This chapter shows you how to realize the examples in《DG10X2 User's Guide》via command lines, you can compare with the user's Guide and get deeper understand for the usage of commands.

The numbers before every command line in these examples are not the contents of command, also for the contents enclosed in " / * " and " * / " behind every command line, which are used to assist user to understand the command well.

Before execute every example, please make sure that all the corresponding devices have been connected correctly.

Example 1: To generate a sine wave via CH1

Target: Generate a sine wave with 20 kHz of frequency, 2.5 Vpp of amplitude, 500mV$_{DC}$ offset and 10° of phase via CH1.

How to realize via commands?

Method1:

```
0  *IDN?                          /* Query ID to check the operating state */
1  VOLT:UNIT VPP                  /* Set the unit of amplitude */
2  APPL:SIN 20000,2.5,0.5         /*Set the frequency, amplitude and offset of the
   sine wave*/
3  PHAS 10                        /* Set the initial phase */
4  OUTP ON                        /*Enable the [Output] connector of CH1 at front
   panel */
```

Method2:

```
0  *IDN?                          /* Query ID to check the operating state */
1  FUNC SIN                       /*Select sine function*/
2  FREQ 20000                     /* Set the output frequency*/
3  VOLT:UNIT VPP                  /* Set the unit of amplitude*/
4  VOLT 2.5                       /* Set the output amplitude */
5  VOLT:OFFS 0.5                  /* Set the offset*/
6  PHAS 10                        /* Set the initial phase */
7  OUTP ON                        /*Enable the [Output] connector of CH1 at front
   panel */
```

Note:

Command VOLT:UNIT VPP and APPL:SIN 20000,2.5,0.5 are equivalent to these five commands together: , FUNC SIN, FREQ 20000, VOLT:UNIT VPP, VOLT 2.5 and VOLT:OFFS 0.5.

Example 2: To generate a built-in arbitrary wave via CH1

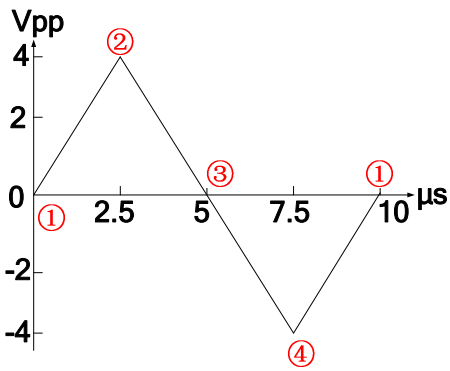
Target: Generate an ExpRise wave with 2MHz of frequency, 5V_{RMS} of amplitude, 10mV_{DC} offset and 60° of phase via CH1.

How to realize via commands?

```
0  *IDN?                    /*Query ID to check the operating state */
1  FUNC:USER EXP_RISE       /* Select built-in wave function */
2  FREQ 2000000             /* Set the output frequency */
3  VOLT:UNIT VRMS           /* Set the unit of amplitude */
4  VOLT 5                   /*Set the output amplitude */
5  VOLT:OFFS 0.01           /* Set the offset */
6  PHAS 60                  /*Set the initial phase */
7  OUTP ON                  /*Enable the [Output] connector of CH1 at front
   panel */
```

Example 3: To generate an user-defined arbitrary wave via CH1

Target: Generate a ramp wave with 10μs of period, 4V of high level and -4V of low level.



The vertical resolution of user-defined arbitrary wave is 14 bits, the value from 0 to 16383 separately corresponds to the minmum and maximum amplitude, that is: -4 V corresponds to 0, 0 V corresponds to 8192 and 4 V corresponds to 16383. So, edit the points in following table is enough.

Point	Time Value	(voltage) Value
1	0s	(0V) 8192
2	2.5μs	(4V) 16383
3	5μs	(0V) 8192
4	7.5μs	(-4V) 0

How to realize via commands?

0 *IDN? /*Query ID to check the operating state */
1 FUNC USER /*select user-defined arbitrary wave*/
2 FREQ 100000 /* Set the frequency as 100kHz (period: 10μs)*/
3 VOLT:UNIT VPP /* Set the unit of amplitude*/
4 VOLT:HIGH 4 /* Set the high level*/
5 VOLTage:LOW -4 /*Set the low level*/
6 DATA:DAC VOLATILE,8192,16383,8192,0

/*Load the 4 decimal numbers to volatile memory */

7 FUNC:USER VOLATILE /*Output the waves in volatile memory */

8 OUTP ON /* Enable the [Output] connector of CH1 at front panel */

Example 4: To generate a FSK wave via CH1

Target: Generate a FSK wave with: 10 kHz, 5 Vpp, 0 V_{DC} of carrier, internal modulation source, 800 Hz of hop frequency and 200 Hz of FSK rate.

How to realize via commands?

```
0  *IDN?                  /* Query ID to check the operating state */
1  FUNC SIN               /*Select carrier function*/
2  FREQ 10000             /* Set the frequency of carrier*/
3  VOLT:UNIT VPP          /* Set the amplitude unit of carrier */
4  VOLT 2.5               /*Set the amplitude of carrier */
5  VOLT:OFFS 0            /* Set the offset of carrier */
6  FSK:STAT ON            /* Enable FSK function*/
7  FSK:SOUR INT           /* Select internal modulation source */
8  FSK:FREQ 800           /* Set the hop frequency */
9  FSK:INT:RATE 200       /* Set the FSK rate*/
10 OUTP ON                /* Enable the [Output] connector of CH1 at front
   panel */
```

Example 5: To generate a linear sweep wave via CH1

Target: Generate a sweep sine wave with: 100 Hz ~ 10 kHz of frequency range, internal trigger, linear mode and 1 s of sweep time.

How to realize via commands?

```
0  *IDN?                  /* Query ID to check the operating state */
1  FUNC SIN               /* Select the sweep function */
2  SWE:STAT ON            /* Enable sweep state*/
3  SWE:SPAC LIN           /* Select linear sweep mode */
4  FREQ:STAR 100          /* Set the start frequency */
5  FREQ:STOP 10000        /* Set the stop frequency */
6  SWE:TIME 1             /* Set the sweep time */
7  TRIG:SOUR IMM          /* Select internal trigger source */
8  OUTP ON                /* Enable the [Output] connector of CH1 at front
   panel */
```

Example 6: To generate a burst via CH1

Target: Generate a burst with: 3-cycle of square, 0° of initial phase, 10 ms of burst period and adopt internal trigger.

How to realize via commands?

```
0  *IDN?                  /* Query ID to check the operating state */
1  FUNC SQU               /* Select burst function */
2  BURS:STAT ON           /* Enable burst state */
3  BURS:MODE TRIG         /* Select the burst mode */
4  BURS:NCYC 3            /* Set the cycle number */
5  BURS:PHAS 0            /* Set the initial phase*/
6  BURS:INT:PER 0.01      /* Set the period */
7  TRIG:SOUR IMM          /* Select internal trigger source */
8  OUTP ON                /* Enable the [Output] connector of CH1 at front
   panel */
```

Example 7: To output waves via dual channels

Target: Output a sine wave with 1kHz, 2.5Vpp, 500mV_{DC}, 10° via CH1 and a ramp wave with 1.5kHz, 5Vpp, 1 V_{DC}, 20° via CH2.

How to realize via commands?

```
0  *IDN?                          /* Query ID to check the operating state */
1  VOLT:UNIT VPP                  /* Set the amplitude unit of CH1 */
2  APPL:SIN 1000,2.5,0.5          /* Set the frequency, amplitude and offset of sine
   wave from CH1 */
3  PHAS 10                        /* Set the initial phase of wave from CH1 */
4  OUTP ON                        /* Enable the [Output] connector of CH1 at front
   panel */
5  VOLT:UNIT:CH2 VPP              /* Set the amplitude unit of CH2*/
6  APPL:RAMP:CH2 1500,5,1         /*Set the frequency, amplitude and offset of
   ramp wave from CH2*/
7  PHAS:CH2 20                    /* Set the initial phase of wave from CH2*/
8  OUTP:CH2 ON                    /* Enable the [Output] connector of CH2 at front
   panel */
9  PHAS:ALIGN                     /*Control the dual channels phase output
   synchronously */
```

Example 8: Channel Coupling

Target: Output a sine wave with 1kHz, 5Vpp, 0V_{DC}, 0° via CH1 and a ramp wave with 1.5kHz, 5Vpp, 0 V_{DC}, 0° via CH2, and then, take CH1 as the base channel and Set the phase deviation as 10°, finally, observe the phase of wave from CH2 after coupling.

How to realize via commands?

0	*IDN?	/* Query ID to check the operating state */
1	VOLT:UNIT VPP	/* Set the amplitude unit of CH1 */
2	APPL:SIN 1000,5,0	/* Set the frequency, amplitude and offset of sine wave from CH1 */
3	PHAS 0	/* Set the initial phase of wave from CH1*/
4	VOLT:UNIT:CH2 VPP	/* Set the amplitude unit of CH2*/
5	APPL:RAMP:CH2 1500,5,0	/* Set the frequency, amplitude and offset of ramp wave from CH2*/
6	PHAS:CH2 0	/* Set the initial phase of wave from CH2*/
7	COUP ON	/* Enable channel coupling function */
8	COUP:BASE:CH1	/* Select CH1 as the base channel */
9	COUP:PHASEDEV 10	/* Set up the phase deviation */
10	PHAS 2	/*Change the phase of waves output from CH1*/
11	PHAS:CH2?	/*Query the phase of waves output from CH2 */

Notes:

1 The return value of "PHAS:CH2?" is 12, which indicates that the phase of CH2 is vary with the phase of CH1 and keeps 10° of phase deviation.

2 The way to set frequency coupling is the same as phase coupling.

Example 9: Channel Copy

Target: Output a sine wave with 1kHz, 500mV$_{DC}$, 10° via CH1 and a ramp wave with 1.5kHz, 2Vpp, 0 V$_{DC}$, 0° via CH2, and then observe the parameters of wave from CH2 after copying CH1 to CH2.

How to realize via commands?

```
0  *IDN?                          /* Query ID to check the operating state */
1  VOLT:UNIT VPP                  /* Set the amplitude unit of CH1*/
2  APPL:SIN 1000,5,0.5            /* Set the frequency, amplitude and offset of sine
   wave from CH1*/
3  PHAS 10                        /* Set the initial phase of wave from CH1*/
4  VOLT:UNIT:CH2 VPP              /* Set the amplitude unit of CH2*/
5  APPL:RAMP:CH2 1500,2,0         /* Set the frequency, amplitude and offset of
   ramp wave from CH2*/
6  PHAS:CH2 0                     /* Set the initial phase of wave from CH2*/
7  COUP OFF                       /* Disable channel coupling to enable channel
   copy */
8  COUP:CHANNC 1>2                /* Copy the wave parameters from CH1 to CH2
   */
                                  /* Query the wav
                                  e parameters of CH2 after copying */
9  FREQuency:CH2?                 /* Return 1.000000e+03 (1kHz)*/
10 VOLTage:CH2?                   /* Return 5.000000e+00 (5Vpp)*/
11 VOLTage:OFFSet:CH2?            /* Return 5.000000e-01 (500mVDC )*/
12 PHAS:CH2?                      /* Return 10.000 (10°)*/
```

Notes:

1 Channel Copy function is only valid for wave parameters but not for wave shapes.

2 Channel Copy function is enabled automatically after Channel Coupling is disabled.

3 Channel Copy function is limited by parameter verification, for the details please refer to <<DG10X2 User's Guide>>.

Appendix: Commands Reference A-Z

*IDN? 2-2

A

AM:SOURce 2-30
AM:SOURce? 2-30
AM:INTernal:FUNCtion 2-30
AM:INTernal:FUNCtion? 2-31
AM:INTernal:FREQuency 2-31
AM:INTernal:FREQuency? 2-31
AM:DEPTh 2-31
AM:DEPTh? 2-31
AM:STATe 2-32
AM:STATe? 2-32
APPLy:SINusoid 2-3
APPLy:SQUare 2-4
APPLy:RAMP 2-4
APPLy:PULSe 2-4
APPLy:NOISe 2-4
APPLy:DC 2-5
APPLy:USER 2-5
APPLy? 2-5
APPLy:SINusoid:CH2 2-5
APPLy:SQUare:CH2 2-5
APPLy:RAMP:CH2 2-6
APPLy:PULSe:CH2 2-6
APPLy:NOISe:CH2 2-6
APPLy:DC:CH2 2-6
APPLy:USER:CH2 2-8
APPLy:CH2? 2-8

B

BURSt:MODE 2-46
BURSt:MODE? 2-46
BURSt:NCYCles 2-47
BURSt:NCYCles? 2-47
BURSt:INTernal:PERiod 2-47
BURSt:INTernal:PERiod? 2-47
BURSt:PHASe 2-47
BURSt:PHASe? 2-48
BURSt:STATe 2-48
BURSt:STATe? 2-48
BURSt:GATE:POLarity 2-48
BURSt:GATE:POLarity? 2-48

C

COUPling 2-61
COUPling? 2-61
COUPling:BASEdchannel 2-61
COUPling:BASEdchannel? 2-61
COUPling:PHASEDEViation 2-62
COUPling:PHASEDEViation? 2-62
COUPling:FREQDEViation 2-62
COUPling:FREQDEViation? 2-62
COUPling:CHANNCopy 2-62

D

DATA 2-49
DATA:DAC 2-50
DATA:COPY 2-50
DATA:DELete 2-51
DATA:CATalog? 2-51
DATA:RENAME 2-51
DATA:NVOLatile:CATalog? 2-51
DATA:NVOLatile:FREE? 2-51
DATA:ATTRibute:POINts? 2-52
DATA:LOAD 2-52
DISPlay 2-60
DISPlay? 2-60

DISPlay:CONTRAST 2-60
DISPlay:LUMInance 2-60

F
FM:SOURce 2-33
FM:SOURce? 2-33
FM:INTernal:FUNCtion 2-33
FM:INTernal:FUNCtion? 2-34
FM:INTernal:FREQuency 2-34
FM:INTernal:FREQuency? 2-34
FM:DEViation 2-34
FM:DEViation? 2-34
FM:STATe 2-35
FM:STATe? 2-35
FREQuency 2-14
FREQuency? 2-14
FREQuency:CH2 2-15
FREQuency:CH2? 2-15
FREQuency:STARt 2-15
FREQuency:STARt? 2-15
FREQuency:STOP 2-15
FREQuency:STOP? 2-16
FREQuency:CENTer 2-16
FREQuency:CENTer? 2-16
FREQuency:SPAN 2-16
FREQuency:SPAN? 2-16
FSK:SOURce 2-39
FSK:SOURce? 2-39
FSK:FREQuency 2-40
FSK:FREQuency? 2-40
FSK:INTernal:RATE 2-40
FSK:INTernal:RATE? 2-40
FSK:STATe 2-40
FSK:STATe? 2-40
FUNCtion 2-9
FUNCtion? 2-9
FUNCtion:USER 2-10
FUNCtion:USER? 2-10
FUNCtion:SQUare:DCYCle 2-11
FUNCtion:SQUare:DCYCle? 2-11
FUNCtion:RAMP:SYMMetry 2-11
FUNCtion:RAMP:SYMMetry? 2-11
FUNCtion:CH2 2-11
FUNCtion:CH2? 2-12
FUNCtion:USER:CH2 2-12
FUNCtion:USER:CH2? 2-13
FUNCtion:SQUare:DCYCle:CH2 2-13
FUNCtion:SQUare:DCYCle:CH2? 2-13
FUNCtion:RAMP:SYMMetry:CH2 2-13
FUNCtion:RAMP:SYMMetry:CH2? 2-13

M
MEMory:STATe:NAME 2-53
MEMory:STATe:NAME? 2-53
MEMory:STATe:DELete 2-53
MEMory:STATe:RECall:AUTO 2-54
MEMory:STATe:RECall:AUTO? 2-54
MEMory:STATe:VALid? 2-54
MEMory:NSTates? 2-54

O
OUTPut 2-22
OUTPut? 2-22
OUTPut:LOAD 2-23
OUTPut:LOAD? 2-23
OUTPut:POLarity 2-23
OUTPut:POLarity? 2-23
OUTPut:SYNC 2-23
OUTPut:SYNC? 2-24
OUTPut:TRIGger:SLOPe 2-24
OUTPut:TRIGger:SLOPe? 2-24
OUTPut:TRIGger 2-24
OUTPut:TRIGger? 2-24
OUTPut:CH2 2-25
OUTPut:CH2? 2-25
OUTPut:LOAD:CH2 2-25

OUTPut:LOAD:CH2? 2-25
OUTPut:POLarity:CH2 2-25
OUTPut:POLarity:CH2? 2-26

P
PHASe 2-58
PHASe? 2-58
PHASe:CH2 2-58
PHASe:CH2? 2-59
PHASe:ALIGN 2-59
PM:SOURce 2-36
PM:SOURce? 2-36
PM:INTernal:FUNCtion 2-36
PM:INTernal:FUNCtion? 2-37
PM:INTernal:FREQuency 2-37
PM:INTernal:FREQuency? 2-37
PM:DEViation 2-37
PM:DEViation? 2-37
PM:STATe 2-38
PM:STATe? 2-38
PULSe:PERiod 2-27
PULSe:PERiod? 2-28
PULSe:WIDTh 2-28
PULSe:WIDTh? 2-28
PULSe:DCYCle 2-28
PULSe:DCYCle? 2-28
PULSe:PERiod:CH2 2-28
PULSe:PERiod:CH2? 2-29
PULSe:WIDTh:CH2 2-29
PULSe:WIDTh:CH2? 2-29
PULSe:DCYCle:CH2 2-29
PULSe:DCYCle:CH2? 2-29

S
SWEep:SPACing 2-42
SWEep:SPACing? 2-42
SWEep:TIME 2-42
SWEep:TIME? 2-43
SWEep:STATe 2-43
SWEep:STATe? 2-43
SYSTem:ERRor? 2-55
SYSTem:VERSion? 2-55
SYSTem:BEEPer:STATe 2-55
SYSTem:BEEPer:STATe? 2-56
SYSTem:LOCal 2-56
SYSTem:RWLock 2-56
SYSTem:REMote 2-56
SYSTem:CLKSRC 2-56
SYSTem:LANGuage 2-57

T
TRIGger:SOURce 2-44
TRIGger:SOURce? 2-44
TRIGger:SLOPe 2-44
TRIGger:SLOPe? 2-45
TRIGger:DELay 2-45
TRIGger:DELay? 2-45

V
VOLTage 2-17
VOLTage? 2-18
VOLTage:HIGH 2-18
VOLTage:HIGH? 2-18
VOLTage:LOW 2-18
VOLTage:LOW? 2-18
VOLTage:OFFSet 2-19
VOLTage:OFFSet? 2-19
VOLTage:UNIT 2-19
VOLTage:UNIT? 2-19
VOLTage:CH2 2-19
VOLTage:CH2? 2-19
VOLTage:HIGH:CH2 2-20
VOLTage:HIGH:CH2? 2-20
VOLTage:LOW:CH2 2-20
VOLTage:LOW:CH2? 2-21
VOLTage:OFFSet:CH2 2-21

VOLTage:OFFSet:CH2? 2-21
VOLTage:UNIT:CH2 2-21
VOLTage:UNIT:CH2? 2-21